REMARKS/ARGUMENTS

In response to the Office Action dated August 2, 2005, the Applicant respectfully submits the above amendments and the following remarks.

Claims 1-13 were rejected under 35 U.S.C. §§ 102 and 103 as unpatentable over the Crititech "Technology" web article ("CritiTech"). The Applicant respectfully submits the following remarks in response to that rejection.

Claim 1, the only independent claim, recites a fluidizing "gas" flow. This is consistent with the Applicant's disclosure, in which a flow of "gas" is used to suspend the medical devices to be coated. See, e.g., Application page 3, line 3 ("fluidizing gas"), page 5, lines 18-19 ("Fluidizing gas source 14 may provide pressurized gas that is free of particulate matter, and in particular may provide nitrogen, argon, air, or any other appropriate gas."); page 6, lines 4-6 ("The high pressure gas may be at a pressure of greater than 20 psi (pounds per square inch), and may in particular be at a pressure of 35 psi.")

A person of ordinary skill in the art would understand that the term "gas" represents a particular state of matter. A "gas" is distinct from a "solid," "liquid," or "supercritical fluid." See "The States of Matter" from www.chemheritage.org (attached). A "gas" does not keep its shape or its volume, and a "gas" only exists at certain temperatures and pressures.

The Crititech reference relates to a process using "supercritical" or "near critical" carbon dioxide (CO_2), i.e., CO_2 near or above its critical pressure and temperature. The CritiTech reference discusses taking advantage of the "unique properties" of CO_2 in such a state. In such a state, CO_2 exhibits certain properties of both a liquid and a gas, but is classified separately from both a liquid and gas, i.e., it is not accurately considered either a liquid or a gas. See "The States of Matter" from www.chemheritage.org, page 3. CO_2 in its supercritical state is useful as a solvent to carry out certain polymerization reactions. Id. The CritiTech process uses this property of supercritical CO_2.

Unlike the CritiTech reference and its use of CO_2 and its unique properties near or above the critical temperature and pressure, the Applicant's claimed process uses a "gas." There is no suggestion in the CritiTech reference for using a "gas," and, indeed, the use of a "gas" instead of supercritical CO_2 with its supercritical properties would be contrary to the teachings of the CritiTech reference.

On the basis of the above amendments and remarks, the Applicant respectfully requests further examination. For the foregoing reasons, the Applicant respectfully submits that the pending claims are now in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Should any questions arise, the Examiner is invited to contact the undersigned at the number given below.

Respectfully submitted,

Dated: Oct. 25, 2005

By: [signature]

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Faces in the Molecular Sciences - Faces in Polymers

Tutorial:

The States of Matter

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Solid, liquid, gas...solid, liquid, gas...solid, liquid, gas... You've probably heard these three words together so many times that they sound like some sort of meditative chant. But don't slip into a blissful trance just yet, because we're going to review just what these three states of matter are, and then we're going to introduce you to some other states of matter that you might not have run across before. As you may notice, we've divided the section on each state into two parts, a macroscopic part that talks about what each phase looks and feels like to your senses, and a microscopic part that talks about what the molecules of a substance in each phase are doing.

Menu

Solids
Liquids
Gases
State Changes
The Supercritical State
The Liquid Crystalline State
The Glassy and Rubbery States

Solids

Macroscopic

Solids are things that hold their shape. Rocks are solids. Your desk is made of solids.

Microscopic

The molecules of a solid don't move around very much. They tend to stay put relative to each other. If a solid has molecules arranged in an orderly fashion, we say it is *crystalline.* If the molecules of a solid are not arranged in any order, we call the solid *amorphous.* Many polymers are crystalline solids, while others are amorphous solids.

Liquids

Macroscopic

Liquids are different from solids in that they don't hold their shape. That is, they flow and we can pour them. The water in a glass is shaped like the glass, until you pour it into a bucket. Then it will be shaped like the bucket. But liquids do keep the same volume. If you poured 1 liter of water from one bucket to another, it would still take up 1 liter of space, no matter what the shape of the buckets.

Microscopic

The molecules of a liquid move around a lot. They bounce off each other and spin around, and slide around from one side of the container to the other. They're always moving relative to each other. This is why liquids don't hold their shape and why they can be poured. You might think of a solid as a marching band, keeping in formation when it moves, while a liquid is more like an unruly mob without any formation. But even though the molecules of a liquid move relative to each other, they are still bound to each other through intermolecular forces. This is why liquids hold their volume.

Gases

Macroscopic

Microscopic

Gases don't keep their shape, and don't keep their volume either. If you had one liter of a gas, such as nitrogen, and you pumped it into a 2-liter jar, the gas would swell to fill up the whole 2 liters.

Another important difference between gases and liquids is that molecules in the liquid state interact with each other through intermolecular forces. These forces hold liquid molecules together. When molecules are in the gas state, they don't interact much. This is why liquids keep their volume but gases do not. Gas molecules aren't held together strongly, so they can spread out, filling as much space as they can.

State Changes

Solids can melt and become liquids, and liquids can boil to become gases. Likewise, gases can condense to become liquids, and liquids can freeze to become solids. Sometimes solids can even become gases without ever becoming liquids. This is called *subliming*. But what makes solids melt, and what makes gases condense?

The simple answer is heat. But what is heat? Most of you probably have felt hot or cold. But what makes something hot or cold? Heat is a form of energy. Heat is the energy of moving molecules. Let's think about an ice cube. An ice cube is a solid, that is, its molecules aren't moving relative to each other. They may be shaking and vibrating, but they stay put. If we heat the ice cube, its molecules start moving around more. If we heat the ice cube enough, the molecules will start moving around relative to each other, and when this happens, the solid ice melts and becomes liquid water. If we keep heating the liquid water, eventually the water molecules will be moving so fast that they won't want to stay with each other anymore. When this happens, the liquid water becomes a gas÷water vapor.

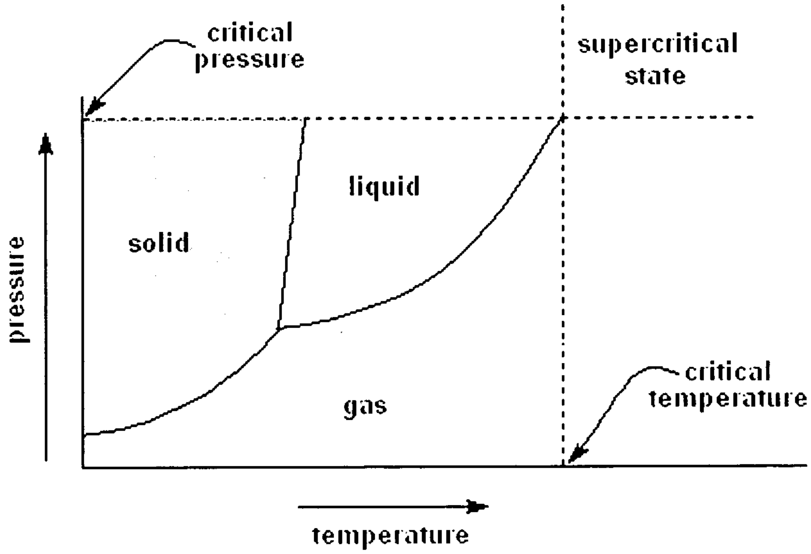
All this can happen backwards, too. If the water vapor gets cold enough, it will condense back into liquid water, and if we keep cooling the water, it will freeze to become ice again.

But Wait, There's More!

So you've always been told that the three states of matter are solid, liquid, and gas, right? It turns out there are some other states of matter that you don't always hear much about in a science class. We're going to look at some of them.

The Supercritical State

This summer, set an ice cube on a hot sidewalk and you'll see first hand that any material can be a solid, liquid, or a gas under the right conditions. Ice is a solid, but when it melts on the hot sidewalk it becomes a liquid. When that liquid water evaporates, it becomes a gas÷water vapor. It's always water, H_2O. That isn't changing. The little H_2O molecules are just passing from one state to another. So water can be a solid liquid or a gas, depending on two things: temperature and pressure. We can even make a fancy little diagram that shows what state water (or any other substance) will be at any temperature and pressure, like you can see below.



But look at the diagram. Above a certain temperature, the critical temperature, and above a certain pressure (the critical pressure), the boundary between gas and liquid disappears. Above this point, called the critical point, the substance acts like a gas in some ways and like a liquid in some ways. The substance is now is a fourth state called the *supercritical* state.

The supercritical state is important to polymers because carbon dioxide in the supercritical state is a useful solvent in which to carry out certain polymerization reactions. Want to know more? Then read Polymers and Supercritical CO_2.

The Liquid Crystalline State

Liquids flow, solids don't. Molecules in the solid phase can be ordered, but molecules in the liquid state are not ordered. Or are they? It is sometimes possible for a material to flow like a liquid even if its molecules are arranged in an orderly fashion. Think of a bunch of logs floating down a river. They're flowing alright, but they always remain ordered, pointed in the same direction. This is how the molecules in liquid crystalline states behave. They are liquids÷they flow and can be poured. But their molecules tend to line up just like the logs in a river. Usually this happens when the molecules of a material are long, thin, and rigid, like logs.

This comes back to polymers eventually. In fact this all came back to polymers many years ago when Stephanie Kwolek unwittingly brewed up the very first known liquid crystalline polymer solution.

Glassy and Rubbery States

This last section is about two states that are only found in polymeric materials. Actually, scientists are still arguing about whether these count as states or not, but they are important, so we're going to talk about them. Have you ever left a flexible plastic bucket outside in the winter time? If you have, you would have seen it become stiff and brittle. When polymers are in the solid state, and amorphous (remember that word?), they can be in either the glassy state or the rubbery state. When that bucket was warm, it was soft and flexible. It was in the rubbery state. But when it gets cold enough, that bucket will become brittle, that is, it will pass into the glassy state.

The temperature at which any polymer passes from the rubbery state to the glassy state or vice versa is called the *glass transition temperature*. Each amorphous polymer has a different glass transition temperature. So some polymers are in the glassy state at room temperature, and others

are in the rubber state. Rubber and soft plastics are in the rubbery state at room temperature, while hard plastics are in the glassy state at room temperature.

It is important to note that a polymer is a solid when it is in the glassy state or the rubbery state. Both states can be thought of as different kinds of solid states.

For more information, at other Web sites...

The Glass Transition ÷ part of *The Macrogalleria* from the University of Southern Mississippi.

Polymers & Liquid Crystals ÷ an excellent tutorial and resource from Case Western Reserve University.

Science Education with Liquid Crystals ÷ from the Center for Advanced Liquid Crystalline Optical Materials at Kent State University.

SFE - Introduction ÷ an introduction to the supercritical state from Durability, Inc.

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